
The Structure and Economic Impact of Utah's Oil and Gas Exploration and Production Industry Phase II - Carbon and Emery Counties

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Table of Contents

1	Executive Summary	1
2	Background	2
3	Utah's Oil and Gas Industry	6
	3.1 Carbon and Emery Counties	9
	3.1.1 Carbon and Emery Counties Economy	13
4	Economic Impacts	19
	4.1 Carbon and Emery Counties	19
5	Fiscal Impacts	22
	5.1 Carbon and Emery Counties	25
6	Technical Notes and Methodology	28
	6.1 NAICS Codes Related to Oil and Gas Production	30
	6.2 Economic Impact Modeling	31
7	References	32

List of Tables

Table 1	U.S. Crude Oil and Natural Gas Production by PADD, 2002-2005	5
Table 2	Land Ownership in Carbon and Emery Counties	10
Table 3	Carbon and Emery Counties Crude Oil Production, 1997-2006	11
Table 4	Carbon and Emery Counties Natural Gas Production (Gross Withdrawals), 1997-2006	12
Table 5	Wells Spudded in Carbon and Emery Counties, 1997-2006	13
Table 6	Carbon and Emery Counties Population, 2002-2006	14
Table 7	Employment by Industry in Carbon and Emery Counties, 2006	16
Table 8	Oil and Gas E&P Employment in Carbon and Emery Counties, 2001-2006	17
Table 9	Average Annual Wage by Industry in Carbon and Emery Counties, 2006	19
Table 10	Direct Employment and Wages in the E&P Industry in Carbon and Emery Counties, 2006	20
Table 11	Employment Due to Oil and Gas E&P in Carbon and Emery Counties, 2006	21
Table 12	Wages Due to Oil and Gas E&P in Carbon and Emery Counties, 2006	22
Table 13	Federal Mineral Royalty Payments and Disbursements for Utah, 2001-2006	23
Table 14	Distribution of Federal Mineral Royalties in Utah	24
Table 15	State Tax Collections Related to Oil and Gas Production, 2001-2006 .	25
Table 16	Oil and Gas Property Tax Payments in Carbon and Emery Counties, 1997-2006	26
Table 17	Federal Mineral Royalties Returned by UDOT to Carbon and Emery Counties, 2001-2006	26
Table 18	Royalties Paid for Production on SITLA Lands in Carbon and Emery Counties, 2005-2006	27
Table 19	Personal State Income Taxes Due to Oil and Gas E&P in Carbon and Emery Counties	28
Table 20	NAICS Codes Related to the Mining Industry	29

List of Figures

Figure 1	Crude Oil Price: NYMEX Near Month Contract for Light Sweet Crude . .	2
Figure 2	Average U.S. Wellhead Price of Natural Gas	3
Figure 3	Petroleum Administration for Defense Districts	4
Figure 4	Utah Crude Oil Production	7
Figure 5	Utah Marketed Natural Gas Production	7
Figure 6	Employment and the Unemployment Rate in Carbon and Emery Counties	14

List of Acronyms & Abbreviations

BCF	Billion Cubic Feet
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
DOGM	Utah Division of Oil, Gas and Mining
E&P	Exploration and Production
IPAMS	Independent Petroleum Association of the Mountain States
MCF	Thousand Cubic Feet
MMCF	Million Cubic Feet
MW	Megawatts
NAICS	North American Industry Classification System
NYMEX	New York Mercantile Exchange
PADD	Petroleum Administration for Defense District
SIC	Standard Industrial Code
SITLA	School and Institutional Trust Lands Administration
RIMS II	Regional Input-Output Modeling System
UDOT	Utah Department of Transportation
USFS	U.S. Forest Service
WTI	West Texas Intermediate Crude

The Structure and Economic Impact of Utah's Oil and Gas Exploration and Production Industry

1 Executive Summary

The Bureau of Economic and Business Research at the University of Utah has completed an economic impact study of the oil and gas exploration and production industry in Carbon and Emery Counties in east-central Utah. Carbon and Emery Counties are an increasingly important center of natural gas production in Utah. Rapidly rising energy prices in recent years have stimulated greater production of both crude oil and natural gas in the northern Rocky Mountains, and the study area is an integral part of the oil and gas industry in the Rocky Mountain area. The study area's natural gas production increased 316 percent from 23.7 BCF in 1997 to 98.5 BCF in 2006.

The rise in oil and gas activity is having a noticeable and positive economic impact on Carbon and Emery Counties. During 2006, the oil and gas exploration and production industry was directly responsible for an estimated 137 jobs and \$6.5 million in wages in the two counties. When including indirect and induced impacts due to company and employee spending, the oil and gas industry accounted for 524 jobs and \$22.2 million in wages in the area. This represents 4.0 percent of total employment and 4.9 percent of total wages in the study area.

The industry also has a sizeable fiscal impact on local governments in the two county area. Property taxes paid on producing oil and gas wells were \$10.2 million in 2006 and accounted for 24.3 percent of all property taxes paid in the two counties. Federal mineral royalties distributed to the two counties by the Utah Department of Transportation during 2006 amounted to \$13.7 million.

2 Background

The recent rise in the price of gasoline has refocused attention on energy markets with an intensity not seen since the collapse of oil prices in the mid 1980s. In contrast to the energy shortage of the 1970s, which was largely driven by constrained supply due to geopolitical issues, the recent runup is a result of increasing demand and decreasing supply from aging fields. Crude oil, and to a lesser extent natural gas, is a worldwide commodity with international supply and demand factors determining prices. Consumption of petroleum products is up worldwide, with developing countries driving the increase. Consumption of petroleum in China grew over 30 percent from 2002 to 2006. This rise in demand has resulted in a dramatic increase in the nominal price of crude oil (Figure 1).

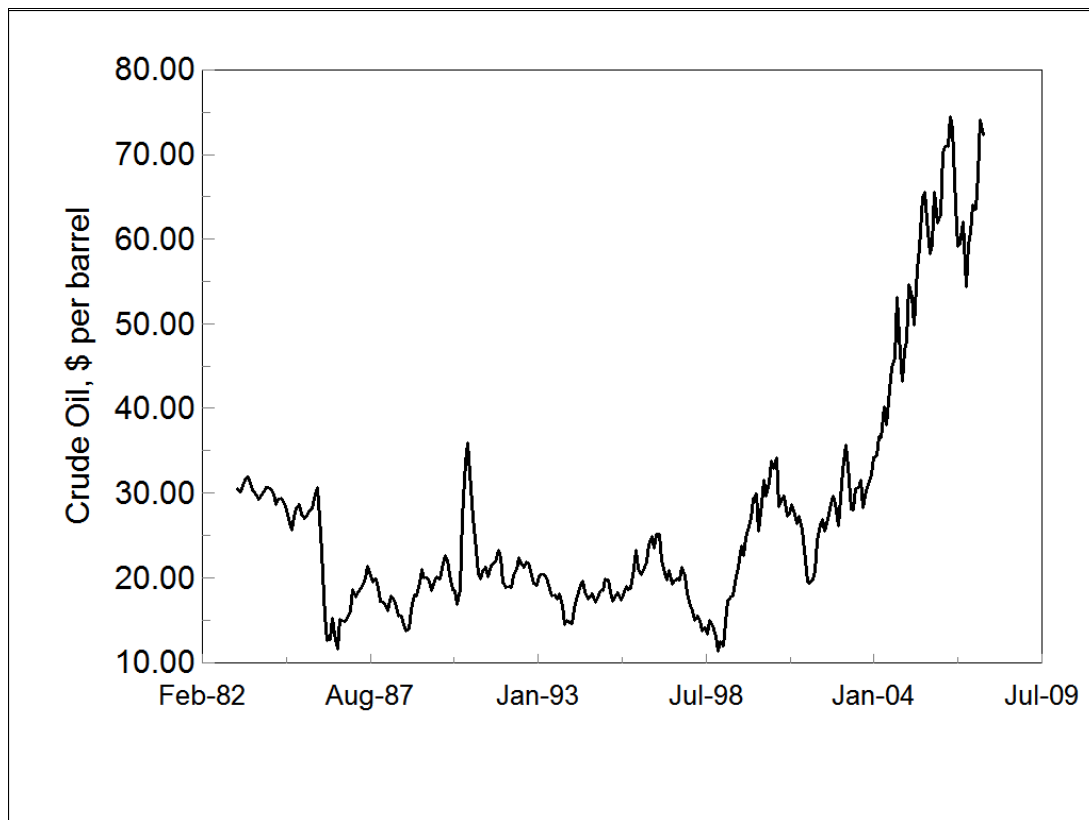


Figure 1 Crude Oil Price: NYMEX Near Month Contract for Light Sweet Crude
Source: Energy Information Administration

The price of crude oil was relatively flat during the 1990s, with prices in the \$20 to \$30 range. Then, from a low of \$11.31 per barrel in December 1998, crude oil increased to over \$70 per barrel in April 2006 and reached \$79.63 in September 2007. Forecasts expect crude oil prices to remain near current levels in the future.

In September 2007 the Energy Information Administration forecast the price of West Texas Intermediate Crude¹ would remain over \$71 per barrel through the end of 2008. During November 2007, prices were in the \$90 per barrel range.

At the same time, natural gas prices have increased from historically low values around \$2 per MCF in the late 1990s to a current price of about \$7 per MCF, with increased volatility in recent years (Figure 2). Natural gas is more of a regional commodity than crude oil, with more dependence on local supply and demand factors. The necessity of transporting natural gas by pipeline results in availability of transportation infrastructure having a large influence on regional prices. Currently, there is a shortage of pipeline capacity in the Rocky Mountains so wellhead natural gas prices in the area are depressed compared to the rest of the country.

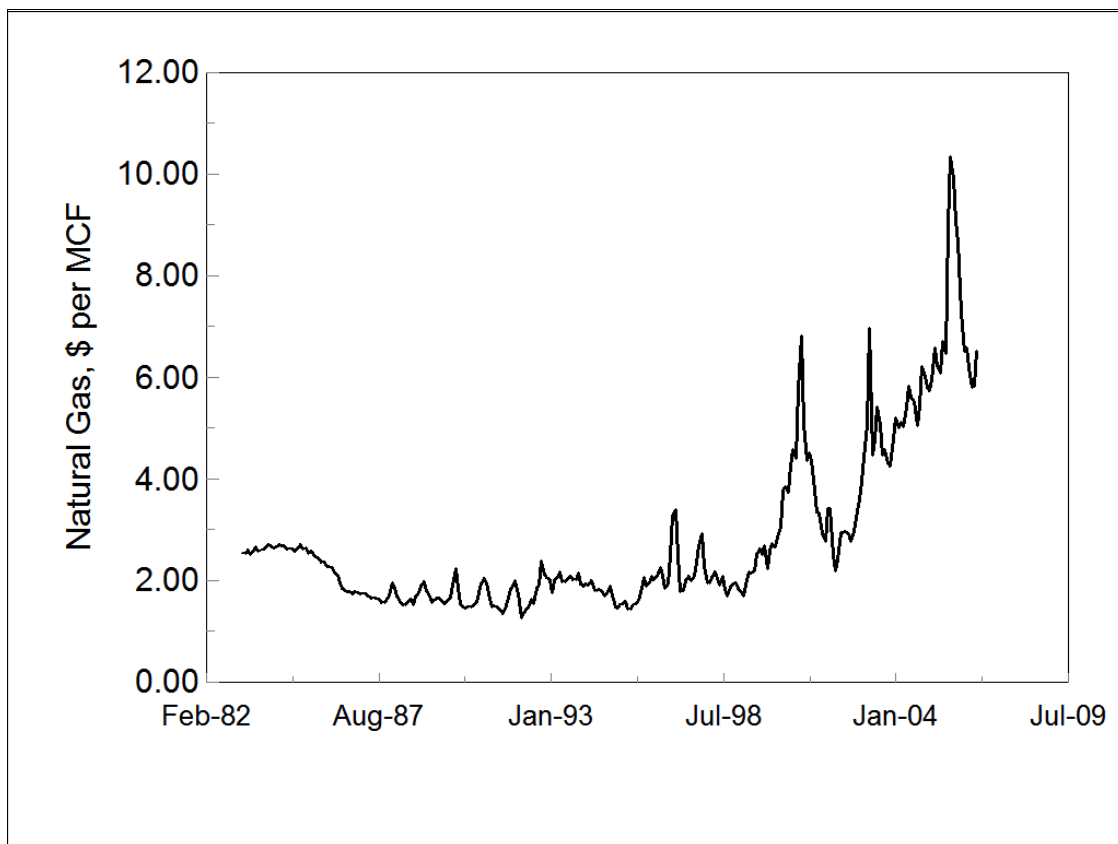


Figure 2 Average U.S. Wellhead Price of Natural Gas
Source: Energy Information Administration

¹West Texas Intermediate (WTI) refers to a crude stream produced in Texas and Oklahoma that is the most common reference or “marker” for pricing crude oil and, along with several other domestic and foreign crude streams, is acceptable for settling New York Mercantile Exchange contracts for light, sweet crude oil.

amount of natural gas produced in PADD III had dropped to 62.5 percent of total production while the amount from PADD IV had increased to 17.0 percent. Additionally, natural gas production in the Rocky Mountains is increasing approximately five percent annually. The increase in crude oil and natural gas production in the Rocky Mountain states is creating an economic boom in the producing areas.

Table 1 U.S. Crude Oil and Natural Gas Production by PADD, 2002-2005

	PADD I	PADD II	PADD III	PADD IV	PADD V	United States Total
Crude Oil, thousand barrels						
2002	7,458	164,635	1,174,305	102,982	947,745	2,097,124
2003	7,170	161,360	1,162,869	105,931	636,123	2,073,453
2004	6,941	159,309	1,103,743	113,069	600,239	1,983,302
2005	8,299	161,587	1,023,499	123,956	572,765	1,890,106
Percent Change, 2002-2005	11.3	(1.9)	(12.8)	20.4	(39.6)	(9.9)
Dry Natural Gas, MMCF						
2002	453,774	2,432,537	12,622,766	2,641,749	776,962	18,927,788
2003	521,824	2,336,271	12,662,381	2,797,202	780,866	19,098,544
2004	520,240	2,428,676	11,960,955	2,935,503	745,517	18,590,891
2005	522,997	2,413,736	11,298,362	3,075,234	763,907	18,074,237
Percent Change, 2002-2005	15.3	(0.8)	(10.5)	16.4	(1.7)	(4.5)
Source: Energy Information Administration						

Despite the common perception of being vertically integrated, the oil and gas industry is highly fragmented, especially at the exploration and production stage. Many companies concentrate exclusively on oil and gas production and have no interest in downstream operations such as pipelines, refineries and product distribution. Additionally, much of the work conducted in the producing fields is contracted to other companies that specialize in different aspects of drilling and maintaining the wells. Few of the operating companies operate their own drill rigs but instead contract with companies that specialize in drilling. Other companies specialize in different operations such as grading well locations, well surveying, running and pulling well casings, cementing wells, perforating well casings and reservoir treatment and stimulation. The operating, drilling and service companies collectively constitute the oil and gas exploration and production industry.

Many other industries benefit from spending by the oil and gas industry. These include consulting geologists and engineering companies, environmental consultants, vendors of oil field equipment, and pipeline and trucking companies. Spending by oil industry employees also benefits the local economy. These economic benefits beyond direct employment in the exploration and production

industry are known as indirect and induced benefits, and are the source of the “multiplier” effect. This study examines the structure of the Utah oil and gas exploration and production industry and the total economic impact on the producing areas.

3 Utah’s Oil and Gas Industry

The Utah oil and gas industry started in 1891, when a water well being drilled in Farmington Bay near the Great Salt Lake encountered natural gas at a depth of 1,000 feet. Gas from several wells in this area was transported to Salt Lake City through wooden pipelines for several years until shifting sand in the lakebed plugged the wells. The first oil was found in the early 1900s near Rozel Point at the north end of the Great Salt Lake, near Mexican Hat in southeastern Utah, and near the town of Virgin in southwestern Utah. The first large-scale commercial oil well was drilled near Vernal in 1948. Since the early 1960s, Utah has consistently ranked in the top 15 oil-producing states and in recent years has experienced a dramatic rise in natural gas production. During 2005, Utah ranked 15th in crude oil production out of 31 states and two Federal Offshore Areas and 11th in dry natural gas production out of 33 states and the Federal Offshore Area in the Gulf of Mexico.

Utah is contributing to the recent growth in crude oil and natural gas production taking place in the Rocky Mountain states (PADD IV). The state’s 2006 crude oil production of 17.9 million barrels was a 37 percent increase over the recent low of 13.1 million barrels produced in 2003 (Figure 4). Although a substantial increase from the recent past, 2006’s output was still only 44 percent of the all-time high of 41.1 million barrels produced in 1985.

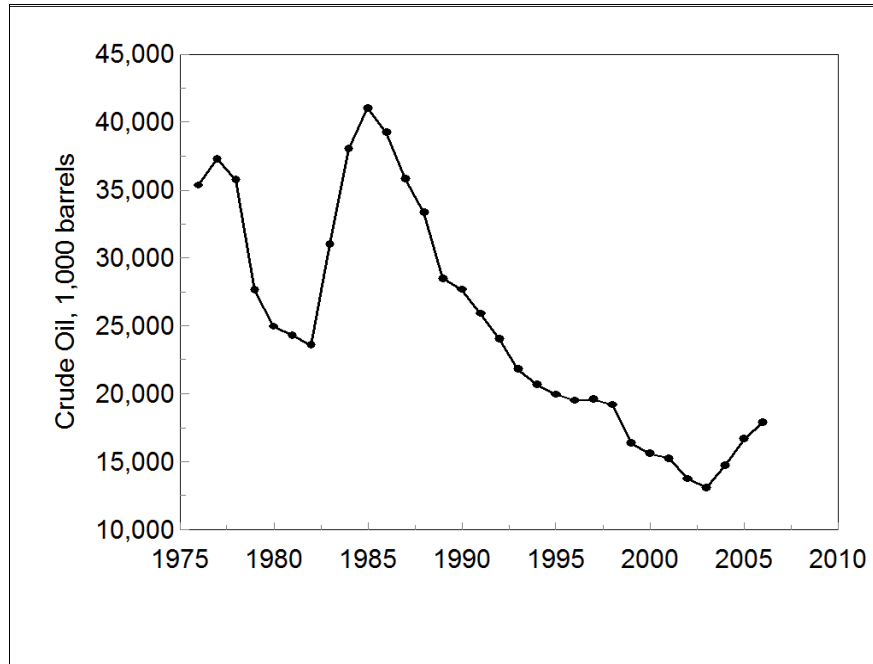


Figure 4 Utah Crude Oil Production
Source: Utah Division of Oil, Gas and Mining

There has been an even greater rise in natural gas production in Utah. In 2006, Utah's marketed natural gas production hit an all-time high of 343 BCF, up 502 percent from 57 BCF in 1976 (Figure 5).

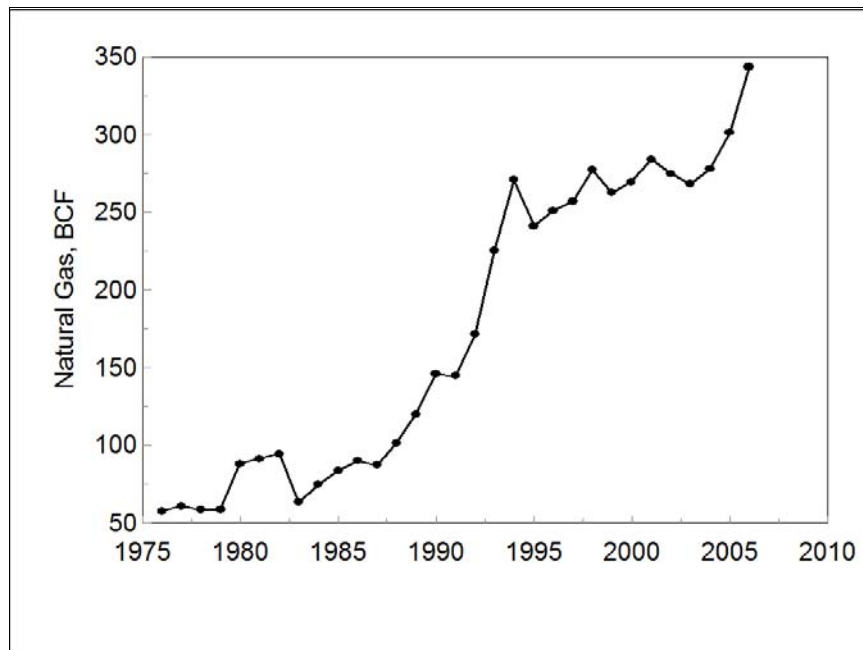


Figure 5 Utah Marketed Natural Gas Production
Source: Utah Geological Survey

Not all gross withdrawals of natural gas are marketed to consumers. Low prices of natural gas during the late 1980s and early 1990s resulted in much of the gas produced in Utah at the time not being marketable. A large portion of the gas withdrawn from wells in Utah during this period was reinjected into the geologic formations to maintain pressure and oil production. The amount of gas used for repressuring in Utah reached a high in 1983, when 65 percent of gross withdrawals were reinjected to maintain pressure. Currently, approximately 95 percent of natural gas withdrawals in Utah are marketed. Most of the gas that is not marketed is used for fuel at the production site or is accounted for by nonhydrocarbon gases that are removed from the production stream prior to marketing.

Average production per well of both crude oil and natural gas has been declining in Utah, so additional drilling will have to continue to maintain production at current levels. Although natural gas production has been steadily rising and crude oil production in Utah has rebounded in recent years, production per individual well has been declining. Natural gas production per gas well peaked at 740 MMCF in 1962. Production per well steadily declined to 67 MMCF in 2000 before rising to 84 MMCF in 2006. Similarly, crude oil production per oil well peaked at 57,330 barrels in 1959, then dropped to 6,727 barrels in 2003. Crude oil production per well in Utah averaged 7,308 barrels during 2006.

During 2006, 129 different operating companies reported crude oil and natural gas production to the Utah Division of Oil, Gas and Mining. Production occurred in 11 of Utah's 29 counties. Duchesne County had the highest oil production with 6,401,299 barrels while Uintah County led natural gas production with gross withdrawals of 204 BCF.

Six different areas in Utah currently have significant production of oil and/or natural gas. These areas are defined by geology. Additionally, these areas are somewhat isolated from one another economically, especially in terms of the oil and gas exploration and production (E&P) industry. The major oil and gas producing area in Utah is the Uinta Basin in the northeastern part of the state. Vernal is a center of the oil and gas industry in the Uinta Basin with many of the producing, drilling and service companies maintaining offices in the area. Other producing areas in Utah include both conventional plays and coalbed methane in Carbon and Emery Counties, the Paradox Basin in San Juan County, the Uncompahgre Uplift in Grand County, the Thrust Belt in Summit County and the recently discovered Hingeline in the central part of the state.

The Paradox Basin, Uncompahgre Uplift, and Thrust Belt all extend over state lines to adjacent states. Many of the workers involved in operating wells in these areas are actually employed in other states. Expanded gas operations in Carbon and

Emery Counties and new oil production in the Hingeline are fairly recent discoveries and an oil service industry has not developed in these areas.

Defining the oil and gas E&P industry is a key element for a study of this type. Economists use the numerical North American Industry Classification System (NAICS) developed by the Office of Management and Budget to classify industries for reporting employment and earnings. The two-digit NAICS codes are divided into 20 major industrial sectors. These two-digit major sectors are then further subdivided as necessary with the addition of more numerical digits after the first two.

The NAICS codes have three industrial subdivision classifications that directly apply to the oil and gas E&P industry. These are NAICS 211 – Oil and Gas Extraction, NAICS 213111 – Drilling Oil and Gas Wells, and NAICS 213112 – Support Activities for Oil and Gas Operations. For purposes of this study, these three industries are collectively considered the oil and gas E&P industry. Additional information on the NAICS codes for these three industries is available in Section 6.

The following section summarizes oil and gas production in Carbon and Emery Counties. Also included are economic data for Carbon and Emery Counties to place the oil and gas E&P industry in context.

3.1 Carbon and Emery Counties

For purposes of this report, the study area is defined as Carbon and Emery Counties, Utah. Coalbed methane production makes up a significant portion of the gas produced in the study area. Coalbed methane is reported as part of the natural gas production in Utah and when referring to production in the study area, the terms methane and natural gas are used synonymously in this report. Although there is potential for coalbed methane production from other coal deposits in Utah, and exploration has been conducted in other areas of the state, coalbed methane production has failed to materialize outside of Carbon and Emery.

The study area in central Utah has emerged as a significant coalbed methane producer over the past 15 years. Initial discoveries in the area were the conventional natural gas fields at Clear Creek in 1951 and at Ferron in 1957. Production noticeably increased in the early 1990s with discovery of the Drunkards Wash Field southwest of Price. Texaco Exploration and Production drilled two wells in 1988 and in 1991 River Gas Corporation took a 92,000-acre farmout from Texaco and commenced exploration. Between 1994 and 1997, exploratory drilling by Texaco established the Buzzard Bench Field between Huntington and Ferron. Meanwhile, Anadarko Petroleum Corp. established the Helper Field north of Price in 1993. Through a series of corporate buy-outs and mergers, ConocoPhillips has emerged as the major operator in the Drunkards Wash Field and is responsible for

almost half of total production in Carbon and Emery Counties. Coalbed methane development and production peaked in 2001-2002 and has declined since then. Recent discoveries of significant conventional gas deposits in deeper reservoirs by Bill Barrett Corporation in the Nine Mile and Peter's Point areas of northeastern Carbon County has brought renewed development activity to this area and started to reverse the overall gas production decline in 2006.

Carbon and Emery Counties contain just under 3.8 million acres (Table 2), with the federal government controlling nearly 72 percent of the land. The Bureau of Land Management is the major federal land-managing agency with responsibility for 2.5 million acres or 65 percent of the total. The U.S. Forest Service manages 6.3 percent of the land in the two counties. There is a small amount of National Park Service land where Capitol Reef National Park extends into the southwest corner of Emery County. With such a large portion of the land controlled by the federal government, the oil and gas E&P industry is highly sensitive to federal land management policy.

The majority of state land in the Carbon and Emery Counties is controlled by the Utah School and Institutional Trust Lands Administration (SITLA). SITLA administers 11.6 percent of the land in the two counties with the Utah Division of Wildlife Resources and the Utah Division of State Parks and Recreation controlling lesser amounts of land. There is a minor amount of Indian land along the Green River at the eastern edge of the two counties. Only 16.2 percent of the land in the two counties is privately held.

Table 2 Land Ownership in Carbon and Emery Counties

	Carbon County, acres	Emery County, acres	Two-County Area Total, acres	Percent of Total
Bureau of Land Management	419,835	2,062,072	2,481,907	65.3
US Forest Service	30,237	210,652	240,889	6.3
National Park Service	0	2,085	2,085	0.1
Total Federal	450,162	2,274,808	2,724,970	71.7
State Parks	0	394	394	0.0
State Wildlife Lands	13,857	2,837	16,694	0.4
State Trust Lands	110,029	331,854	441,883	11.6
Total State Lands	123,887	335,085	458,972	12.1
Indian Lands	73	37	110	0.0
Private	373,511	240,425	613,936	16.2
Total	947,632	2,850,356	3,797,988	100.0
Source: Utah Governor's Office of Planning and Budget				

Production of both natural gas and crude oil in the study area has increased dramatically over the past 10 years, although there has been a decrease in natural

gas production in recent years. Although 2006 crude oil production in the two counties was nearly 10 times that of 1997, the area remains a minor producer of crude oil in Utah (Table 3). The 2006 production of 31,942 barrels of crude oil was 0.2 percent of statewide production.

Table 3 Carbon and Emery Counties Crude Oil Production, 1997-2006

	Crude Oil, barrels			
	Carbon County	Emery County	Two-County Area Total	State Total
1997	0	3,354	3,354	19,592,548
1998	0	3,662	3,662	19,223,542
1999	527	1,649	2,176	16,376,521
2000	211	3,279	3,490	15,609,030
2001	128	4,552	4,680	15,273,926
2002	46	2,493	2,539	13,770,860
2003	1,885	6,191	8,076	13,098,424
2004	4,661	4,657	9,318	14,799,208
2005	9,468	3,196	12,664	16,675,302
2006	27,906	4,036	31,942	17,926,580
Percent of State Total, 2006	0.2	0.0	0.2	100.00
Source: Utah Division of Oil, Gas and Mining				

The study area is primarily a producer of natural gas, while oil production is minor, generally as an associated byproduct of gas production. Over the past 10 years, natural gas production in the area increased from 23.7 BCF in 1997 to 104.6 BCF in 2002 before declining to 98.5 BCF in 2006 (Table 4). Even with the decline from 2002, production in 2006 was over four times the level in 1997. During 2006, the two counties were responsible for 27.7 percent of natural gas production in Utah. Although Carbon County produces the bulk of the natural gas from the two counties, production in Emery County has been growing faster. From 1997 to 2006, natural gas production in Emery County increased by over 1,600 percent, while production in Carbon County increased by only 262 percent.

**Table 4 Carbon and Emery Counties Natural Gas Production
(Gross Withdrawals), 1997-2006**

	Natural Gas, MCF			
	Carbon County	Emery County	Two-County Area Total	State Total
1997	22,760,216	926,911	23,687,127	272,553,774
1998	31,903,361	1,345,422	33,248,783	297,503,246
1999	50,175,216	2,317,596	52,492,812	277,494,312
2000	72,586,085	4,042,810	76,628,895	281,170,016
2001	86,532,946	7,718,744	94,251,690	300,975,578
2002	90,700,883	13,901,494	104,602,377	293,030,004
2003	85,179,739	17,213,152	102,392,891	287,141,238
2004	79,238,531	17,443,464	96,681,995	293,735,994
2005	74,822,590	16,606,967	91,429,557	313,465,305
2006	82,337,741	16,199,707	98,537,448	356,361,028
Percent of State Total, 2006	23.1	4.5	27.7	100.0
Source: Utah Division of Oil, Gas and Mining				

Drilling activity in the two counties reflects the rise in natural gas production that occurred in the late 1990s (Table 5). Drilling peaked with 148 wells spudded in 2001. At the time, the two counties accounted for 23.6 percent of all wells spudded in the state. Drilling declined to only 36 wells spudded in 2004, but rising gas prices stimulated additional drilling activity and the number of wells spudded hit 78 in 2006. The number of wells drilled in the area can be expected to continue to rise in the future. In September 2005, Bill Barrett Corporation announced plans and began work on an environmental impact statement to drill 750 new gas wells in the West Tavaputs area of northeast Carbon County.

Table 5 Wells Spudded in Carbon and Emery Counties, 1997-2006

	Wells Spudded			
	Carbon County	Emery County	Two-County Area Total	State Total
1997	41	23	64	430
1998	74	3	77	430
1999	110	16	126	283
2000	122	55	144	540
2001	104	44	148	627
2002	51	53	104	391
2003	34	14	45	480
2004	32	4	36	659
2005	59	27	86	889
2006	57	21	78	1,057
Percent of State Total, 2006	5.4	2.0	7.4	100.00
Source: Utah Division of Oil, Gas and Mining				

3.1.1 Carbon and Emery Counties Economy

While production of both crude oil and natural gas is increasing in the Carbon and Emery Counties, this increase must be placed in the context of the complete economy for the two counties.

The two counties had an estimated 2006 population of 29,942, down 1.5 percent from 2002 (Table 6). Major cities include Price, with an estimated 2006 population of 8,010, Huntington (2,061), Helper (1,886), Castle Dale (1,617), Wellington (1,570) and Ferron (1,569). The 2000 Decennial Census determined that 40.5 percent of the population lives in the urban area of Price. The remainder of the two counties are not densely enough populated to be considered urban.² Although it contained over 40 percent of the population of the two counties, Price accounts for only 0.15 percent of the area in the two counties.

²The Bureau of the Census defines urban areas as census blocks that have a population density of at least 1,000 persons per square mile and surrounding census blocks with a population density of 500 persons per square mile. Adjacent census blocks with a lower population density are also included if they meet criteria established by the Bureau of the Census.

Table 6 Carbon and Emery Counties Population, 2002-2006

	Population			
	Carbon County	Emery County	Two-County Area Total	State Total
2002	19,858	10,540	30,398	2,358,330
2003	19,558	10,477	30,035	2,413,618
2004	19,385	10,493	29,878	2,469,230
2005	19,338	10,491	29,829	2,547,389
2006	19,504	10,438	29,942	2,615,129
Source: Utah Population Estimates Committee				

The study area is benefitting economically from the boom in energy prices, with the unemployment rate dropping from 8.3 percent in January 2004 to 3.8 percent in September 2007 (Figure 6). Since energy prices have been increasing, employment in the study area has steadily risen, from 13,000 persons in January 2003 to 15,299 persons in September 2007. Although the unemployment rate in the area has been dropping, it has consistently been above the state average since the beginning of 1997.

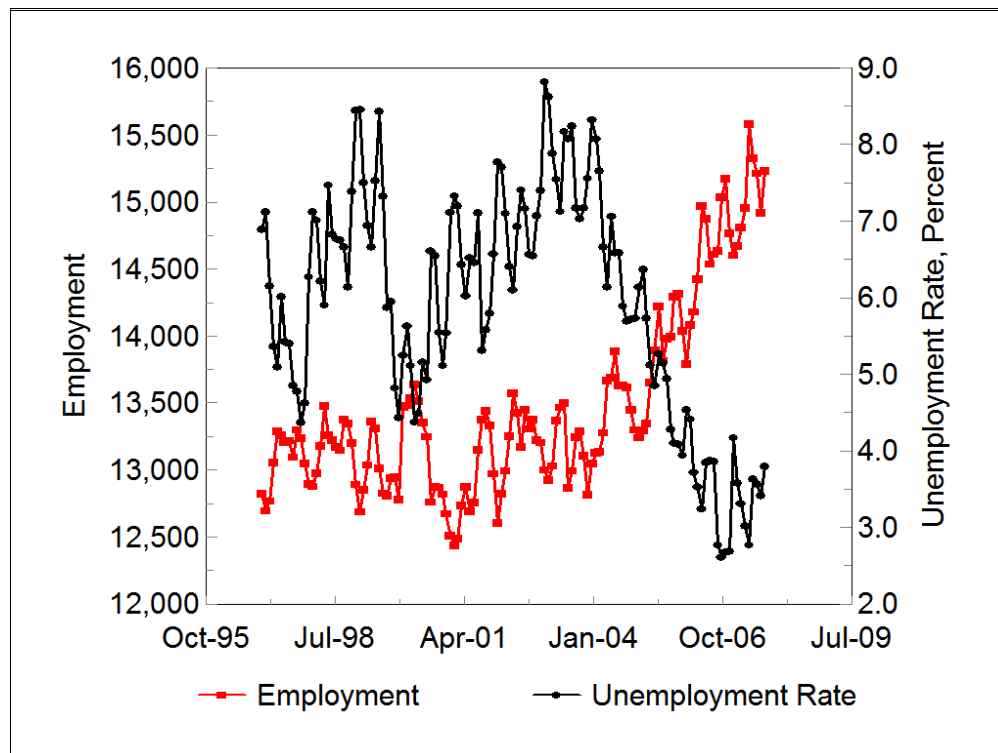


Figure 6 Employment and the Unemployment Rate in Carbon and Emery Counties
Source: BLS, Local Area Unemployment Statistics

The industrial structure of the two counties has significant differences from that of the state of Utah (Table 7). Mining (NAICS 21) constitutes a significant portion of the economy with both coal mining and oil and gas production figuring prominently. There is also one gypsum operation in Emery County and several sand and gravel operations. Approximately 90 percent of the Mining (NAICS 21) employment in the two counties is due to coal mining, not oil and gas production. Although coal mining employment is not disclosable by federal data agencies because of the small number of firms, the Utah Geological Survey determined that coal mining employment was 1,657 jobs in the two counties during 2006.

Utilities (NAICS 22) are also a major portion of the area's economy due to the presence of three coal-fired power plants with a total summer generating capacity of 2,387 MW. The Hunter Plant (1,320 MW) is located south of Castle Dale and the Huntington Plant (895 MW) is sited at the mouth of Huntington Canyon near Huntington; both are located in Emery County. The Carbon Plant (172 MW) is in Price Canyon north of Price in Carbon County. Although Utility industry (NAICS 22) employment is not disclosable for Emery County due to the concentration of employment in one company, the presence of the three power plants results in the electric utility industry being an important component of the area's economy.

Several other major industries have employment data that are not disclosable for Carbon or Emery Counties. This is done to protect individual company data. In Carbon County, besides Mining, employment data are nondisclosable for Agriculture, Forestry, Fishing and Hunting (NAICS 11); Educational Services (NAICS 61); and Health Care (NAICS 62). Emery County has a smaller economy than Carbon County and has eight industries with nondisclosable data. These are the same industries that were nondisclosable in Carbon plus Utilities (NAICS 22), Wholesale Trade (NAICS 42), Management of Companies and Enterprises (NAICS 55), and Administrative and Support (NAICS 56). Since employment numbers are not reported for these industries, location quotients³ can not be calculated.

Industries for which employment was reported and which have low location quotients in the study area include Manufacturing (NAICS 31-32); Real Estate (NAICS 53); Professional, Scientific and Technical Services (NAICS 54); and Arts, Entertainment and Recreation (NAICS 71). Manufacturing has a location quotient of 0.32, indicating that the area is only 32 percent as dependent on Manufacturing for employment as is the state of Utah.

³Location Quotients are the ratio of an industry's share of employment in a study area, in this case Carbon and Emery Counties, to its share in a reference area, e.g., the state of Utah.

Table 7 Employment by Industry in Carbon and Emery Counties, 2006

	Carbon County	Emery County	Two-County Area	Distribution, Percent	Location Quotient
Private Employment					
Agriculture, Forestry, Fishing and Hunting (NAICS 11)	ND	ND	ND	NA	NA
Mining (NAICS 21)	ND	ND	ND	NA	NA
Utilities (NAICS 22)	138	ND	ND	NA	NA
Construction (NAICS 23)	393	338	731	5.6	0.69
Manufacturing (NAICS 31-32)	418	17	435	3.4	0.32
Wholesale Trade (NAICS 42)	450	ND	ND	NA	NA
Retail Trade (NAICS 44-45)	1,286	433	1,719	13.3	1.10
Transportation and Warehousing (NAICS 48-49)	300	135	435	3.4	0.92
Information (NAICS 51)	127	132	259	2.0	0.75
Finance and Insurance (NAICS 52)	192	52	244	1.9	0.41
Real Estate (NAICS 53)	59	6	65	0.5	0.33
Professional, Scientific and Technical Services (NAICS 54)	220	59	279	2.2	0.41
Management of Companies and Enterprises (NAICS 55)	58	ND	ND	NA	NA
Administrative and Support (NAICS 56)	371	ND	ND	NA	NA
Educational Services (NAICS 61)	ND	ND	ND	NA	NA
Health Care (NAICS 62)	ND	ND	ND	NA	NA
Arts, Entertainment and Recreation (NAICS 71)	71	0	71	0.5	0.37
Accommodation and Food Services (NAICS 72)	742	169	911	7.0	0.90
Other Services (NAICS 81)	342	143	485	3.7	1.50
Government Employment	1,978	823	2,801	21.6	1.32
Total Employment	9,067	3,887	12,954	100.0	1.00
ND: Not disclosed to protect individual company information. NA: Not Applicable.					
Source: BLS, Quarterly Census of Employment and Wages					

Both the concentration of the coalbed methane industry and its recent development in Carbon and Emery Counties are reflected in the employment data released by the Bureau of Labor Statistics (Table 8). If an industry is dominated by one company in an area, data are not released to prevent disclosure of individual company data. Much of the employment data specific to the oil and gas industry is not disclosable in Carbon and Emery Counties. Two characteristics of the industry in the two counties contribute to this. First, few operating companies maintain offices in the area. Only three operating companies (NAICS 211) reported employment in the area during 2006. The three companies were all located in Carbon County. The Drunkards Wash Field in Carbon County, currently operated by ConocoPhillips, is sufficiently large compared to other fields in the area that employment is concentrated in one company. Second, since the coalbed methane industry is a relatively recent development in the area, with major production occurring over the past 15 years, a sizable oil and gas service industry has not developed in the two counties, resulting in employment for drilling and service companies not being disclosable.

Table 8 Oil and Gas E&P Employment in Carbon and Emery Counties, 2001-2006

	NAICS 211 Oil and Gas Extraction	NAICS 213111 Drilling Oil and Gas Wells	NAICS 213112 Support Activities for Oil and Gas Operations
Carbon County			
2001	ND	0	19
2002	ND	0	ND
2003	ND	ND	44
2004	ND	ND	32
2005	ND	ND	ND
2006	ND	ND	ND
Emery County			
2001	0	0	ND
2002	0	0	ND
2003	0	0	ND
2004	ND	0	ND
2005	0	0	ND
2006	0	0	ND
ND: Not disclosed to protect individual company data. Source: BLS, Quarterly Census of Employment and Wages			

In the absence of data from the government statistical agencies, operating companies with offices in the area were contacted to obtain employment information. Currently, three operating companies maintain offices in the two

counties and directly employ 72 persons. Data obtained from these companies indicate that the average annual wage paid by companies in the Oil and Gas Extraction industry (NAICS 211) in the area is approximately \$52,000 annually. Data from the Bureau of Labor Statistics indicates that the average annual wage in Carbon County for the Support Activities for Mining industry (NAICS 213) was \$43,100 during 2006. Both the well drilling companies (NAICS 213111) and service companies (NAICS 213112) are subsets of the Support Activities for Mining (NAICS 213) industry and should pay similar wages.

Of the major industries in the two counties, only coal mining, Construction and Utilities pay a higher average wage (Table 9). The average wage for coal mining for the two counties is not disclosed by the government statistical agencies, but the statewide average annual wage for coal mining was \$62,666 in 2006. Since 82 percent of the coal mining employment in Utah is located in Carbon and Emery Counties, the wage in these counties should be close to the statewide average. The average annual wage for Utilities in Carbon County was \$81,156 in 2006. Since the majority of employment in the Utilities industry in both counties are power plant operators, the average annual wage for the industry in Emery County should be similar. The average wage for Construction was \$56,139 in Carbon County and \$38,988 in Emery County during 2006.

Table 9 Average Annual Wage by Industry in Carbon and Emery Counties, 2006

	Carbon County	Emery County
Private Employment		
Agriculture, Forestry, Fishing and Hunting (NAICS 11)	ND	ND
Mining (NAICS 21)	ND	ND
Utilities (NAICS 22)	\$81,156	ND
Construction (NAICS 23)	56,139	\$38,988
Manufacturing (NAICS 31-32)	44,177	31,440
Wholesale Trade (NAICS 42)	44,491	ND
Retail Trade (NAICS 44-45)	19,084	13,226
Transportation and Warehousing (NAICS 48-49)	35,915	33,142
Information (NAICS 51)	20,694	30,837
Finance and Insurance (NAICS 52)	28,541	21,634
Real Estate (NAICS 53)	17,345	3,521
Professional, Scientific and Technical Services (NAICS 54)	16,938	29,393
Management of Companies and Enterprises (NAICS 55)	45,990	ND
Administrative and Support (NAICS 56)	20,550	ND
Educational Services (NAICS 61)	ND	ND
Health Care (NAICS 62)	ND	ND
Arts, Entertainment and Recreation (NAICS 71)	11,612	0
Accommodation and Food Services (NAICS 72)	9,066	10,551
Other Services (NAICS 81)	22,390	36,379
Government Employment	30,401	26,789
All Employment	32,603	39,864
ND: Not disclosed to protect individual company information.		
Source: BLS, Quarterly Census of Employment and Wages		

4 **Economic Impacts**

While rising energy prices are translating into rising employment and wages in the producing areas, not all of the economic gains are occurring in the oil and gas industry. The total increase in local economic conditions due to oil and gas activity is greater than the direct gain in the industry. This is the “multiplier effect” often referred to in economics and is a result of local spending by the industry for goods and services and spending of wages by the industry’s employees. These additional economic benefits are known as the indirect and induced benefits.

In this study, economic impact is defined as the effect on employment and wages in the subject areas. Additional information on economic impact is available in Section 6 and in several listed references.

4.1 Carbon and Emery Counties

The study area of Carbon and Emery Counties is an important component of the oil and gas E&P industry in Utah. In turn the industry is becoming more important to the local economy as additional wells are drilled, resulting in rising employment and

wages. Since the industry is a relatively recent development in the area, many of the service companies have not established a permanent presence there but work out of offices in the Uinta Basin. Employment in the two counties in the oil and gas E&P industry is estimated at 137 persons, or 1.1 percent of total employment during 2006 (Table 10). Due to the industry paying higher than average wages, total wages in the area are estimated at \$6.5 million, or 1.5 percent of total wages for 2006.

Table 10 Direct Employment and Wages in the E&P Industry in Carbon and Emery Counties, 2006

	Carbon and Emery Counties Total	
	Employment	Wages, \$1,000
Total	12,954	450,623
E&P Industry, Direct	137	6,546
E&P Industry, percent of total	1.1	1.5
Source: BLS, Quarterly Census of Employment and Wages; Utah Department of Workforce Services FirmFind; interviews with companies; author's estimates.		

In addition to the direct employment, additional jobs and wages due to spending by the industry and employees results in significant economic benefits to the study area. Other employment due to spending by the E&P industry is not limited to the mining industry but is distributed throughout different industries. Total employment in the two-county area due to the E&P industry, including direct, indirect, and induced, was estimated at 4.0 percent of total jobs in the area in 2006 (Table 11). When examining employment by industry, the oil and gas industry is shown to have significant effects on several other industries.

The E&P industry is responsible for 14.1 percent of total employment in the Construction industry in Carbon and Emery Counties. Additionally, 7.1 percent of the Real Estate employment in the area is due to oil and gas operations. There are an estimated 10 additional mining jobs in the area due to the oil and gas operations; these jobs are in addition to the estimated 137 jobs directly in the E&P industry. When considering both the direct jobs and the additional indirect and induced jobs in the mining industry, the oil and gas E&P industry is responsible for 8.1 percent of total mining jobs in the two counties, based on Utah Geological Survey estimates of coal mining employment in the area. The coal mining industry, which is much more labor intensive, is responsible for the bulk of the remaining mining jobs.

Although there are government employees located in the Coalbed Methane Area to regulate the oil and gas industry, these are not considered part of the Mining industry. The state Division of Oil, Gas and Mining has an office in Price and there are also local BLM and USFS employees dedicated to regulating the industry. For purposes of employment classification, these employees are considered to be

employed in NAICS 92 – Public Administration, which is included in the government employment in Table 11.

Table 11 Employment Due to Oil and Gas E&P in Carbon and Emery Counties, 2006

	Two-County Area Total Employment	Total Employment Due to Oil and Gas E&P	Oil and Gas E&P Employment, percent of total
Private Employment			
Agriculture, Forestry, Fishing and Hunting (NAICS 11)	ND	1	NA
Mining (NAICS 21)	1,804	147	8.1
Utilities (NAICS 22)	ND	44	NA
Construction (NAICS 23)	731	103	14.1
Manufacturing (NAICS 31-32)	435	5	1.2
Wholesale Trade (NAICS 42)	ND	10	2.1
Retail Trade (NAICS 44-45)	1,719	68	4.0
Transportation and Warehousing (NAICS 48-49)	435	16	3.7
Information (NAICS 51)	259	4	1.4
Finance and Insurance (NAICS 52)	244	6	2.3
Real Estate (NAICS 53)	65	5	7.1
Professional, Scientific and Technical Services (NAICS 54)	279	4	1.5
Management of Companies and Enterprises (NAICS 55)	ND	1	NA
Administrative and Support (NAICS 56)	ND	10	NA
Educational Services (NAICS 61)	ND	11	NA
Health Care (NAICS 62)	ND	25	NA
Arts, Entertainment and Recreation (NAICS 71)	71	3	3.6
Accommodation and Food Services (NAICS 72)	911	34	3.7
Other Services (NAICS 81)	485	27	5.5
Households	NA	2	NA
Government Employment	2,801	NA	NA
All Employment	12,954	524	4.0
ND: Nondisclosable. Data are included in the totals. NA: Not applicable.			
Source: BLS, Quarterly Census of Employment and Wages; author's calculations.			

Oil and gas E&P accounts for just under five percent of all wages paid in the two counties (Table 12). The industry is responsible for a higher percentage of wages than employment due to oil and gas E&P paying above average wages. The oil and gas industry is responsible for 6.6 percent of an estimated \$111 million in wages in the Mining (NAICS 21) industry in the two counties. Both the Construction (NAICS 23) and Real Estate (NAICS 53) industries have more than 10 percent of their total wages due to spending by the oil and gas industry.

Table 12 Wages Due to Oil and Gas E&P in Carbon and Emery Counties, 2006

	Two-County Area Total Wages, \$1,000	Total Wages Due to Oil and Gas E&P, \$1,000	Oil and Gas E&P Wages, percent of total
Private Employment			
Agriculture, Forestry, Fishing and Hunting (NAICS 11)	ND	9	NA
Mining (NAICS 21)	111,000	7,359	6.6
Utilities (NAICS 22)	ND	3,891	NA
Construction (NAICS 23)	35,249	4,241	12.0
Manufacturing (NAICS 31-32)	18,992	260	1.4
Wholesale Trade (NAICS 42)	ND	458	2.3
Retail Trade (NAICS 44-45)	30,198	1,542	5.1
Transportation and Warehousing (NAICS 48-49)	15,243	945	6.2
Information (NAICS 51)	6,713	191	2.8
Finance and Insurance (NAICS 52)	6,599	218	3.3
Real Estate (NAICS 53)	1,044	117	11.2
Professional, Scientific and Technical Services (NAICS 54)	5,450	207	3.8
Management of Companies and Enterprises (NAICS 55)	ND	56	NA
Administrative and Support (NAICS 56)	ND	214	NA
Educational Services (NAICS 61)	ND	233	NA
Health Care (NAICS 62)	ND	924	NA
Arts, Entertainment and Recreation (NAICS 71)	825	44	5.4
Accommodation and Food Services (NAICS 72)	9,660	530	5.5
Other Services (NAICS 81)	12,846	678	5.3
Households	NA	36	NA
Government Employment	82,266	NA	NA
All Employment	450,623	22,151	4.9
ND: Not disclosed. NA: Not applicable.			
Source: BLS, Quarterly Census of Employment and Wages; author's calculations.			

5 Fiscal Impacts

The oil and gas industry also has fiscal impacts on the local areas. Fiscal impacts refer to impacts on government finances and tax collections. The oil and gas industry is subject to the tax laws common to all businesses. There are also impacts unique to the industry. Production on federal land is subject to a royalty payment under the Mineral Lands Leasing Act of 1920. This royalty is paid to the Minerals Management Service, an agency within the U.S. Department of Interior. A portion of the federal mineral royalties is returned to the state of origin, generally one-half. Royalties from production on Indian lands are returned to the appropriate tribe, not to the state government. Since a large portion of the crude oil production in Utah occurs on Indian lands, especially in Duchesne and San Juan Counties, the amount of crude oil royalty returned to the state government is significantly less than one-half of the amount paid to the Minerals Management Service. The states have full discretion as to the distribution of federal mineral royalties as long as priority is given to areas with economic and/or social impacts from leasing activities. The

Minerals Management Service does not release federal mineral royalty data at the county level, but statewide data are available.

Federal mineral royalties due to oil and gas production in Utah have increased dramatically from \$91 million in 2001 to nearly \$300 million in 2006, a 228 percent rise (Table 13). Oil and gas production accounted for 91.3 percent of the royalties paid for mineral production on federal land in Utah during 2006. There was also an additional \$103 million paid in bonuses and rents on federal mineral leases. These are fees associated with awarding federal mineral leases and maintaining the leases until production is initiated. Table 13 includes royalties due to oil and gas production, but does not include bonus or rent payments for federal oil and gas leases. Of the nearly \$300 million paid in federal mineral royalties by the oil and gas industry in Utah, \$109 million was returned to the state government.

Table 13 Federal Mineral Royalty Payments and Disbursements for Utah, 2001-2006

	Oil		Natural Gas		Total	
	Royalties	Disbursements	Royalties	Disbursements	Royalties	Disbursements
2001	\$32,799,794	\$4,392,667	\$58,553,527	\$26,210,621	\$91,353,321	\$30,603,288
2002	26,028,911	3,493,794	37,653,050	11,921,373	63,681,961	15,415,167
2003	37,462,357	5,575,810	55,369,036	26,040,706	92,831,293	31,616,515
2004	45,743,590	7,235,629	87,075,857	38,228,494	132,819,447	45,464,122
2005	66,900,212	10,405,687	118,132,687	53,647,636	185,032,900	64,053,323
2006	106,457,298	21,866,066	193,416,183	87,551,457	299,873,481	109,417,522
Note: Years are federal fiscal years. Natural gas includes natural gas liquids from gas processing plants.						
Source: Minerals Management Service						

In Utah, federal mineral royalties are distributed to several different accounts according to state law (Table 14). The largest recipients of federal mineral royalties in Utah are the Permanent Community Impact Fund and the Department of Transportation. The funds distributed to the Department of Transportation are then distributed to local governments to fund local highways in proportion to the amount of mineral lease money generated by each county. The Permanent Community Impact Fund makes loans and grants to state agencies and subdivisions of state government impacted by mineral resource development. Unlike the funds administered by the Department of Transportation, which are distributed in proportion to royalties generated in the county, the Permanent Community Impact Fund is distributed by a state-appointed board in response to proposals submitted by state agencies and local governments. Therefore, the distribution of funds by the Permanent Community Impact Fund to the various counties may vary from the amount of royalty generated. The payments in lieu of taxes cited in Table 14 are not the payments in lieu of taxes made by the federal government for federal land in Utah but are payments made by the state government to counties for lands

controlled by the School and Institutional Trust Lands Administration, state Division of Parks and Recreation and the state Division of Wildlife Resources.

Table 14 Distribution of Federal Mineral Royalties in Utah

	Percent
Permanent Community Impact Fund	32.50
State Board of Education	2.25
Utah Geological Survey	2.25
Water Research Laboratory	2.25
Department of Transportation	40.00
Department of Community and Culture	5.00
Payments in Lieu of Taxes	52 cents per acre
Permanent Community Impact Fund	Remainder
Note: The amount paid for Payments in Lieu of Taxes has been adjusted annually since 1994 according to the Consumer Price Index. Source: Utah State Code, Title 59, Chapter 21.	

The School and Institutional Trust Lands Administration (SITLA) controls mineral rights on approximately 4.4 million acres in Utah. These lands are held in trust for the public schools in Utah and 11 other beneficiaries. They were established at statehood and through land exchanges with the federal government. During 2006, royalties paid for oil and gas extraction on SITLA lands totaled \$82.7 million. This was 51.0 percent of total SITLA revenue for 2006. These funds are not returned to the county of origin, but are placed in a permanent fund managed by the state treasurer on behalf of the public schools or distributed to the appropriate beneficiary as mandated. Dividends and interest from the Public School Fund are distributed annually to all Utah public schools based on an established formula.

In addition to royalties, there is an Oil and Gas Severance Tax in Utah and an Oil and Gas Conservation Fee that are levied on all production in the state. Revenue from the Oil and Gas Severance Tax is placed in the state general fund and the tax rate varies from 3 to 5 percent of the sales price. The Oil and Gas Conservation Fee funds the state Division of Oil, Gas and Mining. The fee is imposed at a rate of 0.2 percent of the value of production.

Both the Oil and Gas Severance Tax and the Oil and Gas Conservation Fee have significantly increased in recent years (Table 15). The Oil and Gas Severance Tax increased by 82 percent from 2001 to 2006, while the Oil and Gas Conservation Fee increased by 102 percent. The drop from 2001 to 2002 was due to the decline of the wellhead price of natural gas produced in Utah from \$3.52 per MCF to \$1.99 per MCF. These data reflect statewide oil and gas operations and are not specific to Carbon and Emery Counties.

Table 15 State Tax Collections Related to Oil and Gas Production, 2001-2006

	Oil and Gas Severance Tax	Oil and Gas Conservation Fee
2001	\$39,357,798	\$2,748,318
2002	18,893,082	1,710,219
2003	26,745,279	1,943,755
2004	36,659,808	2,696,250
2005	53,484,320	3,631,963
2006	71,513,869	5,560,449
Note: Years are state fiscal years.		
Source: Utah State Tax Commission		

5.1 Carbon and Emery Counties

The largest direct fiscal impacts on Carbon and Emery Counties due to oil and gas operations in the area are property taxes paid by the operating companies and federal mineral royalties distributed to the local governments by the Utah Department of Transportation. The Utah State Tax Commission centrally assesses oil and gas properties using a net present value approach applied to future production. The local county treasurers bill and collect the taxes. Property taxes are levied by numerous units of local government, including county and city governments, school districts, and special service districts.

Property taxes paid on oil and gas properties have become a significant portion of total property taxes in the two counties (Table 16). During 2006, the oil and gas industry paid nearly 25 percent of total property taxes in the two counties. Over one-third of the property tax paid in Carbon County during 2006 was due to oil and gas production and just over one-tenth of the property tax in Emery County was due to oil and gas. The two large power plants located in Emery County mean that 65 percent of property taxes in Emery County are paid by the utilities industry. Table 16 refers to all property taxes paid to various government entities in the two counties, not just the county governments. As the price of natural gas has increased in recent years, the net present value of future production has increased. This, coupled with rising production, has resulted in the amount of property taxes paid by the oil and gas industry in the two counties increasing by over 25 times over the past 10 years, not adjusting for inflation. Oil and gas property taxes have been rising faster in Emery County than in Carbon County, reflecting rising natural gas production in the county. Property taxes paid on oil and gas production increased by 4,622 percent in Emery County from 1997 to 2006, and by 2,155 percent in Carbon County. Given the rising production and expected continuation of current energy prices, the property taxes paid by the oil and gas production industry in the two counties should continue to rise into the future.

Table 16 Oil and Gas Property Tax Payments in Carbon and Emery Counties, 1997-2006

	Carbon County		Emery County		Two-County Area Total	
	Oil & Gas Property Tax	Percent of Total Property Tax	Oil & Gas Property Tax	Percent of Total Property Tax	Oil & Gas Property Tax	Percent of Total Property Tax
1997	\$359,255	3.0	\$44,722	0.2	\$403,977	1.2
1998	653,781	4.9	56,297	0.3	710,078	2.2
1999	1,233,733	10.2	144,661	0.7	1,378,394	4.4
2000	3,316,312	22.2	237,473	1.2	3,553,785	10.4
2001	4,779,864	28.0	547,486	2.8	5,327,350	14.4
2002	4,290,845	26.5	755,816	4.1	5,046,661	14.6
2003	4,567,518	24.5	985,587	5.5	5,553,105	15.1
2004	6,576,519	32.8	1,496,054	8.2	8,072,573	21.1
2005	7,418,552	38.7	1,836,886	10.2	9,255,438	24.9
2006	8,101,170	35.8	2,111,766	10.9	10,212,936	24.3
Source: Utah State Tax Commission, Property Tax Division Annual Reports						

In terms of property taxes paid, the oil and gas industry has a greater fiscal impact on Carbon and Emery Counties than does the coal mining industry. In 2006, property taxes charged against coal mines in the two counties totaled \$3,483,001, or 34.1 percent of the amount charged against oil and gas wells.

The funds generated through federal mineral royalties that are returned to the two counties through the Utah Department of Transportation are also a significant source of revenue for the local governments. These funds actually exceed the amount of property tax paid by the oil and gas industry. During 2006, Carbon and Emery Counties collectively received \$13.7 million dollars in federal mineral royalties returned to them by the Department of Transportation (Table 17). This was a 70 percent increase over the amount returned in 2001.

Table 17 Federal Mineral Royalties Returned by UDOT to Carbon and Emery Counties, 2001-2006

	Carbon County	Emery County	Two-County Area Total
2001	\$5,140,732	\$2,900,800	\$8,041,532
2002	2,260,889	1,703,743	3,964,632
2003	3,233,674	2,208,352	5,442,026
2004	5,421,384	3,761,439	9,182,823
2005	7,050,220	4,082,628	11,132,848
2006	10,145,446	3,566,833	13,712,279
Note: Years are state fiscal years.			
Source: Utah Department of Transportation			

Table 17 includes data on all royalties from federal mineral leases in Utah, not just oil and gas operations. There is significant coal production from federal leases in the two counties and a major portion of the federal mineral royalties returned by UDOT may be due to coal production. Almost all federal mineral royalties in the two counties are the result of energy production, whether coal, oil or natural gas. The rise in energy prices in recent years, coupled with the resultant production increases, has had a noticeable fiscal impact on the two counties.

Royalties paid to SITLA due to production of oil and gas in Carbon and Emery Counties dropped slightly from 2005 to 2006 (Table 18).

Table 18 Royalties Paid for Production on SITLA Lands in Carbon and Emery Counties, 2005-2006

	Carbon County	Emery County	Two-County Area Total
2005	\$21,077,378	\$5,775,864	\$26,853,242
2006	19,786,589	5,355,106	25,141,695
Note: Years are state fiscal years.			
Source: School and Institutional Trust Lands Administration			

Most of the Drunkards Wash Field is on land controlled by SITLA and SITLA receives royalties for oil and gas production. Previous, the Drunkards Wash area was administered by the BLM but was acquired by SITLA in 1998 as part of a land exchange agreement with the federal government. Since there were preexisting federal leases in the area, the agreement stated the two county governments would not lose federal mineral royalties as a result of the land exchange. Originally, SITLA remitted one-half of the royalties received from the Drunkards Wash Field (after deducting a 3 percent administrative fee) to the state Mineral Lease Account. This account also receives federal mineral royalties returned to the state by the federal government and the funds deposited by SITLA were mingled with federal mineral royalties and distributed according to state law (Table 14). The other half of the royalties from the Drunkards Wash Field are retained by SITLA for disbursement to the various beneficiaries.

As of March 15, 2007, Utah state law changed and royalties from the Drunkards Wash Field previously deposited in the state Mineral Lease Account are now returned by the state Division of Finance to the county of origin. Between March 15, 2007 and the end of September 2007, \$2.3 million had accrued with the state Division of Finance and were awaiting distribution to the two county governments.

Fiscal effects also arise from the direct, indirect and induced impacts of the oil and gas E&P industry. State personal income taxes as a result of oil and gas E&P activities in the two counties are estimated at \$681,000 for 2006 (Table 19).

Table 19 Personal State Income Taxes Due to Oil and Gas E&P in Carbon and Emery Counties

	Two-County Area Total
Total Wages due to Oil and Gas E&P, \$1,000	22,151
Personal State Income Taxes, \$1,000	681
Source: Author's Calculations. Details of the estimation are in Section 6.	

6 Technical Notes and Methodology

Industries are classified by economists according to the North American Industry Classification System (NAICS), which was developed by the Office of Management and Budget in cooperation with other federal agencies and foreign governments (Office of Management and Budget, 2007). The NAICS codes replaced the Standard Industrial Classification (SIC) Codes that had been used since the 1930s. This change was prompted by structural changes in the U.S. economy, with the services sector becoming a much larger portion of the economy and more complex than when the SIC codes were developed. In the switch, the 10 major industrial sectors under the SIC codes were replaced with 20 major sectors under the NAICS codes. Many of the industrial sectors under the SIC codes were split among two or more of the redefined NAICS sectors, making comparisons difficult. The NAICS codes better explain the structure of the current economy but make time series data difficult to compile.

Under the NAICS system, 20 major industrial categories are further subdivided as needed. To demonstrate the level of detail obtained, Table 20 presents the divisions of the Mining (NAICS 21) sector. The Mining sector is divided into a total of 28 different industries. The other 19 industrial sectors are similarly subdivided.

Other local businesses and industries benefit from E&P activities. Examples of these are seismic companies, regulatory and environmental consulting firms, consulting geologists, trenching and dirtwork, and electric utilities. Other benefits accrue to local hotels and restaurants as a result of spending by visiting workers. These types of effects are referred to as the indirect and induced impacts. The indirect and induced impacts can be calculated from the value of transactions between the E&P industry and these other businesses using input-output economic models.

Table 20 NAICS Codes Related to the Mining Industry

NAICS Code	Industry
21	Mining, Quarrying, and Oil and Gas Extraction
211	Oil and Gas Extraction
2111	Oil and Gas Extraction
21111	Oil and Gas Extraction
211111	Crude Petroleum and Natural Gas Extraction
211112	Natural Gas Liquid Extraction
212	Mining (except Oil and Gas)
2121	Coal Mining
21211	Coal Mining
212111	Bituminous Coal and Lignite Surface Mining
212112	Bituminous Coal Underground Mining
212113	Anthracite Mining
2122	Metal Ore Mining
21221	Iron Ore Mining
212210	Iron Ore Mining
21222	Gold and Silver Ore Mining
212221	Gold Ore Mining
212222	Silver Ore Mining
21223	Copper, Nickel, Lead and Zinc Mining
212231	Lead Ore and Zinc Ore Mining
212234	Copper Ore and Nickel Ore Mining
21229	Other Metal Ore Mining
212291	Uranium-Radium-Vanadium Ore Mining
212299	All Other Metal Ore Mining
2123	Nonmetallic Mineral Mining and Quarrying
21231	Stone Mining and Quarrying
212311	Dimension Stone Mining and Quarrying
212312	Crushed and Broken Limestone Mining and Quarrying
212313	Crushed and Broken Granite Mining and Quarrying
212319	Other Crushed and Broken Stone Mining and Quarrying
21232	Sand, Gravel, Clay and Ceramic and Refractory Minerals Mining and Quarrying
212321	Construction Sand and Gravel Mining
212322	Industrial Sand and Gravel Mining
212324	Kaoline and Ball Clay Mining
212325	Clay and Ceramic and Refractory Minerals Mining
21239	Other Nonmetallic Mineral Mining and Quarrying
212391	Potash, Soda, and Borate Mineral Mining
212392	Phosphate Rock Mining
212393	Other Chemical and Fertilizer Mineral Mining
212399	All Other Nonmetallic Mineral Mining
213	Support Activities for Mining
2131	Support Activities for Mining
21311	Support Activities for Mining
213111	Drilling Oil and Gas Wells
213112	Support Activities for Oil and Gas Operations
213113	Support Activities for Coal Mining
213114	Support Activities for Metal Mining
213115	Support Activities for Nonmetallic Minerals (except Fuels) Mining

6.1 NAICS Codes Related to Oil and Gas Production

There are three classifications directly related to the oil and gas exploration and production industry. These are NAICS 211 – Oil and Gas Extraction, NAICS 213111 – Drilling Oil and Gas Wells, and NAICS 213112 – Support Activities for Oil and Gas Operations. These three classifications cover the operating companies, drilling companies, and service companies, respectively. For this study, we consider them collectively as the oil and gas E&P industry. The definitions listed are those developed by the Office of Management and Budget.

NAICS 211 – Oil and Gas Extraction Industries in the Oil and Gas Extraction subsector operate and/or develop oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operation of separators, emulsion breakers, desilting equipment and field gathering lines for crude petroleum and natural gas; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. The subsector includes the production of crude petroleum, the mining and extraction of oil from oil shale and oil sands, and the production of natural gas, sulfur recovery from natural gas, and recovery of hydrocarbon liquids.

Establishments in this subsector include those that operate oil and gas wells on their own account and for others on a contract or fee basis. Establishments primarily engaged in providing support services, on a fee or contract basis, required for the drilling or operation of oil and gas wells (except geophysical surveying and mapping, mine site preparation, and construction of oil/gas pipelines) are classified in Subsector 213, Support Activities for Mining.

NAICS 213111 – Drilling Oil and Gas Wells This U.S. industry comprises establishments primarily engaged in drilling oil and gas wells for others on a contract or fee basis. This industry includes contractors that specialize in spudding in, drilling in, redrilling, and directional drilling.

NAICS 213112 – Support Activities for Oil and Gas Operations This U.S. industry comprises establishments primarily engaged in performing support activities on a contract or fee basis for oil and gas operations (except site preparation and related activities). Services included are exploration (except geophysical surveying and mapping); excavating slush pits and cellars; well surveying; running, cutting, and pulling casings, tubes, and rods; cementing wells, shooting wells; perforating well casings; acidizing and chemically treating wells; and cleaning out, bailing, and swabbing wells.

6.2 Economic Impact Modeling

Economic impacts on an economy arise from exogenous sources or activities that inject new funds into the economy. Examples include products that are exported and new construction funding. It is important for outside funds to be injected into a regional economy for economic impacts to occur. If an activity is financed by funds from inside a regional economy, known as residentiary spending, then the funds are diverted from one industrial sector to another and there is no net multiplier effect or economic impact. Crude oil and natural gas from the producing areas in Utah are exported to refineries and markets in other portions of the country. Exporting oil and gas results in an inflow of funds, which creates a positive economic impact on the area.

In this study, economic impact is used to mean the impact of oil and gas E&P activities on the amount of employment and wages paid in the various producing regions in Utah. Many similar studies present the total economic output of an activity as the economic impact; this is the sum of all transactions in a supply chain and can be much larger than the value of the final good or service provided to the end consumer. Similarly, many authors apply economic output multipliers to all spending related to an activity, with no distinction between export-based and residentiary spending. The result is often termed “economic contribution” and presented as economic impact. As with all economic output calculations, the result is much larger than the value of the final product delivered to an end consumer.

The oil and gas exploration and production industry has a direct impact on the local economy through employment and wages paid. In addition, there are additional indirect and induced impacts. Indirect impacts result from local spending by the E&P industry and induced impacts arise from employees of the E&P industry spending their earnings.

Examples of indirect impacts are employment and wages at seismic companies, regulatory and environmental consulting firms, consulting geologists, trenching and dirtwork, and utilities providing electricity. Other benefits accrue to local hotels and restaurants as a result of spending by visiting workers. The indirect and induced impacts can be calculated from the value of transactions between the E&P industry and these other businesses.

The RIMS II input-output model developed by the Bureau of Economic Analysis was used to determine the indirect and induced economic impacts of the oil and gas exploration and production industry in Carbon and Emery Counties. The RIMS II model is based on an accounting framework called an input-output table. From each industry, an input-output table shows the industrial distribution of inputs purchased and outputs sold. The Bureau of Economic Analysis has developed a

national input-output table (Bureau of Economic Analysis, 1997). To develop region-specific input-output tables, the national input-output table is modified using regional economic data. The producer portion of the input-output table is modified using location quotients at the six-digit NAICS level based on personal income data for service industries and wage and salary data for nonservice industries. Household data is modified to account for commuting across regional boundaries and savings and taxes. Once the national input-output table is regionalized, the multipliers are estimated through the use of matrix algebra. The RIMS II model estimates the employment and wage impacts by major NAICS industry.

Data on spending by the E&P industry in the two counties was obtained via a survey of operating, drilling and service companies operating in the area. Personnel with the Bureau of Economic and Business Research at the University of Utah worked with the Independent Petroleum Association of the Mountain States (IPAMS) to develop survey forms with input from several representatives of the petroleum industry. IPAMS distributed the survey forms to operating, drilling and service companies operating in Carbon and Emery Counties and the forms were returned to the Bureau of Economic and Business Research. Data from returned survey forms was totaled by spending category. Using data on total production of oil and gas, number of wells spudded and employment reported by government agencies, the total spending reported by responding companies was expanded to total industry spending in the region. The multipliers from the RIMS II model were then applied to the total spending by category to determine the indirect and induced employment and wages. Trade margins were applied to the Retail Trade, Wholesale Trade, and Transportation industries.

State income tax impacts were estimated by calculating the ratio of the Utah income tax liability for Carbon and Emery Counties to the sum of the total earnings by place of work for the two counties as determined by the Bureau of Economic Analysis. The average of this ratio for the years 2003 through 2005 was 4.02 percent. This ratio was then applied to the total estimated earnings due to oil and gas E&P in Carbon and Emery Counties of \$22.2 million to estimate the state personal income tax.

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